

Cave chaetognaths in the Canary Islands (Atlantic Ocean)

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Abstract.—Morphological and biometric observations of chaetognaths found in a submarine cave on the southeast coast of Tenerife (Canary Islands) are presented. The specimens, that we have called *Spadella* aff. *ledoyeri*, differ notably from the coastal species *Spadella cephaloptera*, which is a well known inhabitant of the submerged seagrass beds of the infralittoral areas of the islands. Because the genus *Paraspadella* was previously described from an anchialine cave on the Grand Bahama Island (western Atlantic Ocean), this is the second record of an Atlantic cave chaetognath and the first for the genus *Spadella* in Atlantic Ocean caves.

The Canary Island benthic chaetognaths, unlike the pelagic species, have only rarely been studied. Among the few studies done are those of Hernández & Jiménez (1992) and Broerse (1993), which deal with biometric aspects of *Spadella cephaloptera* (Busch, 1851) in the island of Tenerife. This species has been found in beds of the submerged sea grass *Cymodocea nodosa* and on patches of the alga *Caulerpa prolifera* in shallow infralittoral areas of the islands of Tenerife (Hernández & Jiménez 1992, Broerse 1993) and Gran Canaria, especially in areas with a sandy substratum. The discovery of benthic cave chaetognaths in the Mediterranean (Casanova 1986, 1992) and in the Bahamas (Bowman & Bieri 1989) has led us to trawl for them in dark submarine caves. Specimens of these organisms were found, but they were different from descriptions of the benthic species *S. cephaloptera*, which is well known in the islands.

Materials and Methods

The material collected comes from a dark, submarine cave, situated on the southeast coast of the island of Tenerife (Canary Islands) (Fig. 1), between the towns of San-

ta Cruz and Candelaria. Two trawls were carried out, using a 200 μm , manual plankton net, 12 m from the entrance and a few cm above the bottom. A total of 42 chaetognath specimens belonging to the genus *Spadella* was obtained.

The specimens were measured to give data on total length, caudal length, ovarian length, and the number of grasping spines and teeth. For comparison, we used specimens of *Spadella cephaloptera*, which were caught on the same dates as the cave species. These were caught in trawls over beds of sea grass and algae off the islands of Tenerife and Gran Canaria.

Cave Characteristics

The cave is a volcanic pipe at the bottom of a submarine canyon. It has a broad entrance and a sandy floor. The cave narrows close to the entrance and then widens out again after about one m. The back of the cave is marked by a natural blockage of sand. The cave is 16 m below ground level, with a slope of 1.3 m and is 15 m deep. Geological interest in the cave stems from the fact that it forms part of the lava fields that flowed from the back of La Esperanza (Tenerife) to the coast and into the sea.

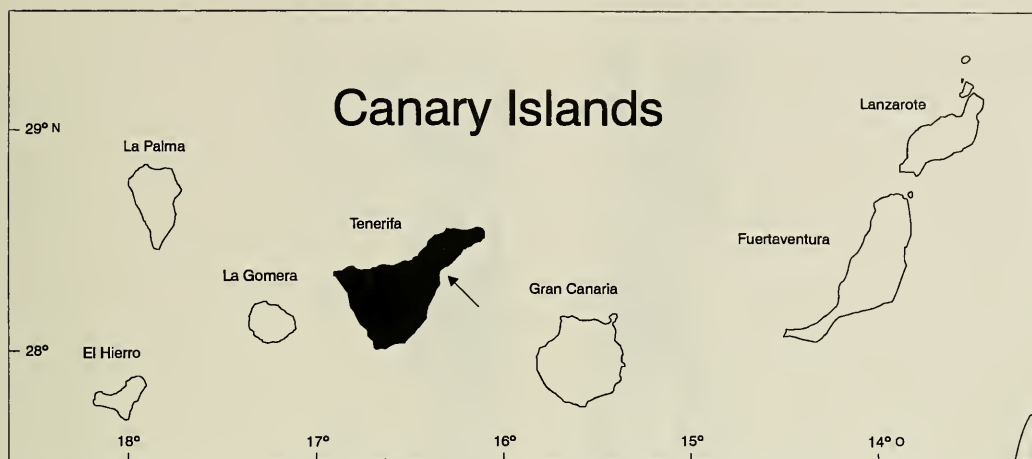


Fig. 1. Location of the sample station in the southeast of Tenerife (Canary Islands).

Apart from the chaetognaths, other fauna found in the cave included shrimps (spawning females of *Plesionika narval*), tubicular Polychaeta, sponges, formations of *Nadracis asperula* (corals), prawns (*Lysmata grabhami*) and echiurids (*Bonellia viridis*).

Results and Discussion

The chaetognaths studied showed the following taxonomic characteristics (Figs. 2, 3): General aspect of the body: white, long, thinner than in *Spadella cephaloptera*, which is thicker and yellowish brown. Head square, not oval as in *S. cephaloptera* (Fig. 2). Short lateral fins (only 50% of the caudal region), wider than in *S. cephaloptera*, which start just before the tail. Ocular pigment present. The ciliata corona is completely circular and different from that of *S. cephaloptera* studied in Tenerife and Gran Canaria, where it is more flattened and bilobed (Fig. 3). Caudal fin completely triangular; in *S. cephaloptera*, it is spatula shaped. Triangular seminal vesicles, separated from the lateral and caudal fins. In *S. cephaloptera*, the seminal vesicles touch both fins. Caudal region strong and broad. Cephalic tentacles and intestinal diverticulae were not observed. Ovaries with large, rounded ovules. Ten or eleven reddish-light brown grasping spines. Only 3–4 anterior

teeth observed. The maximum size for stage III sexual maturity is 4.5 mm (4.3 mm, mean) (Table 1). Biometric data is also provided for each sexual stage of the specimens of this study (Table 1). These data have been compared with the specimens corresponding to the Tenerife (Hernández & Jiménez 1992) and Gran Canaria specimens (Table 2).

The specimens collected in the cave belong to the genus *Spadella*, but do not present the typical characteristics of *Spadella cephaloptera*. The specimens studied are closer to *Spadella ledoyeri*, a cave dwelling chaetognath of the Mediterranean (Casanova 1986). Among the morphological differences between our specimens and those of *S. cephaloptera*, we observed: the shape of the ciliata corona, shape and position of seminal vesicles, shape, position and extension of the lateral fins, shape and general aspect of the body, shape and size of the collarette and the aspect of the eye pigment. Although the shape of the ciliata corona can vary (Ghirardelli 1968), the characteristics are valid and have a high taxonomic value.

Concerning Atlantic cave-dwelling chaetognaths, the only other species on record is *Paraspadella anops*, described from a single specimen from Sagittarius Cave near Gran Bahama Island (Bowman & Bieri

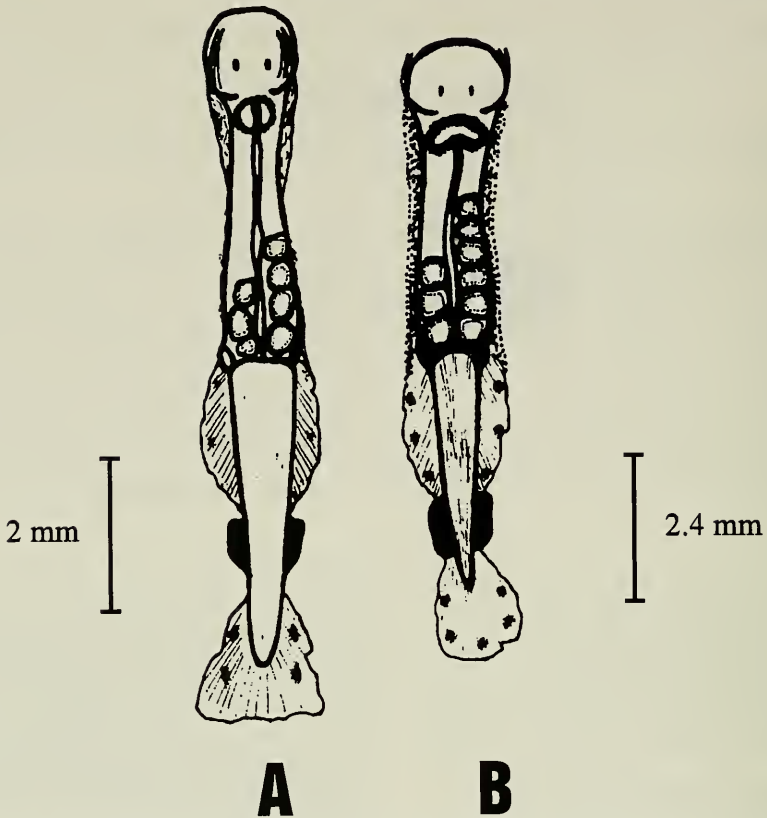


Fig. 2. Selected specimens from the samples. A, *Spadella* aff. *ledoyeri*; B, *Spadella cephaloptera*.

1989). This species, as in the case of our specimens of *Spadella ledoyeri*, is clearly the descendent of *Paraspadella schizoptera*, the common neritic species of the region, from which it differs in only a few characteristics.

Likewise, *Spadella ledoyeri* is believed to have evolved from either *Spadella cephaloptera*, isolated in the caves of the

Mediterranean from submergence during the most recent ice age, or alternatively, from the deep water species, *Spadella birostrata*, isolated in cavities of deeper caves flooded during a prior glaciation (Casanova 1992).

For the first time in the Atlantic Ocean, benthic chaetognaths of the genus *Spadella* from underwater caves are described. In the

Table 1.—Biometric characteristics of stage III specimens of *Spadella* aff. *ledoyeri* on Tenerife. TL = total length, CL = caudal length, %C/T = relative tail length in relation to total length.

	TL (mm)	CL (mm)	%C/T
Stage I <i>n</i> = 1	3.0	1.5	50.0
Stage II <i>n</i> = 23	3.0–4.5 average: 3.9	1.5–2.5 average: 2.0	42.9–55.6 average: 50.0
Stage III <i>n</i> = 18	4.0–4.5 average: 4.3	2.0–2.5 average: 2.2	44.4–55.6 average: 51.5

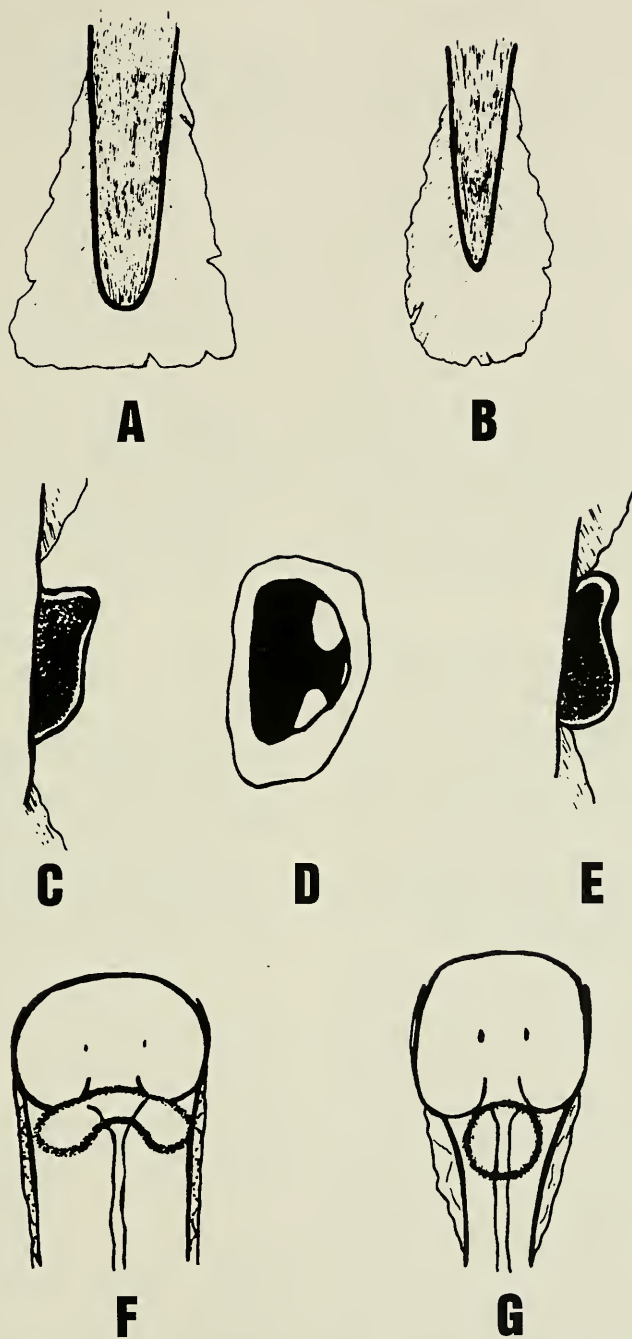


Fig. 3. *Spadella* aff. *ledoyeri*. A, caudal fin; B, seminal vesicle; C, ocular pigment; D, head and neck. *Spadella cephaloptera*. E, caudal fin; F, seminal vesicle; G, head and neck.

Table 2.—Comparison of total length (TL) for stage III specimens of *Spadella* aff. *ledoyeri* from Gran Canaria and Tenerife.

TL (mm)	Island	Month	Habitat
5.5	Gran Canaria	April	seagrass
4.0	Tenerife	April	seagrass
3.5	Tenerife	December	seagrass
4.5	Tenerife	April	cave

Canary Islands, therefore, as is the case in the Mediterranean (Casanova 1992, genus *Spadella*) and the Bahamas (Bowman & Bieri 1989, genus *Paraspadella*), these animals exist in the biotope of submarine caves, where, according to the above mentioned authors, there are original populations.

New collections will be done, at different times of the year, extending the study to other caves in the islands, in order to investigate the biological cycle and to clarify certain aspects, which are debated in the Mediterranean, of the origin of the cave dwelling species and make accurate comparisons between *Spadella* aff. *ledoyeri* and the coastal species *Spadella cephaloptera* from waters surrounding the Islands.

Acknowledgments

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